

2000-0015-06
USSN 10/670,406AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

1-4. (canceled)

5. (currently amended) An apparatus for producing effective bandwidths of a pulse laser beam of a narrow band electric discharge laser having a line narrowing unit comprising a grating and a fast tuning mechanism, said apparatus comprising:

- A) a beam monitor monitoring said laser beam to determine bandwidth of individual laser pulses,
- B) a bandwidth determination mechanism determining a desired effective bandwidth for improved results in an integrated circuit lithography production operation, and,
- C) an adjusting mechanism periodically adjusting the tuning mechanism during a series of pulses so that the nominal wavelengths of some pulses in said series of pulses are slightly longer than a target wavelength and the nominal wavelengths of some pulses in said series of pulses are slightly shorter than the target wavelength in order to produce for the series of pulses an average spectrum centered approximately at the target wavelength with average spectral deviation from the target wavelength approximately equal to a desired deviation.

6. (previously presented) An apparatus as in Claim 5 further comprising said line narrowing unit comprises a piezoelectric drive unit.

7. (previously presented) An apparatus as in Claim 6 further comprising said line narrowing unit comprises a tuning mirror driven by said piezoelectric drive unit.

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8. (currently amended) An apparatus as in Claim 5 further comprising a wavemeter in which the bandwidths of individual pulses are determined by determining a slit function of a spectrometer, determining a raw data spectrum, for said laser, convolving the raw data spectrum with the slit function to produce a forward convolved spectrum, determining width for the forward convolved spectrum W_{FC} and a width of the raw data spectrum W_R , and computing an estimate of the width of the true spectrum W_T by a formula equivalent to:

$$W_T = W_R - (W_{FC} - W_R).$$

9. (currently amended) An apparatus as in Claim 1 5 further comprising the line narrowing unit comprises a turning mirror and a turning mirror dithering mechanism.

10. (currently amended) A photo lithography light source of bursts of pulses of laser produced light having a desired nominal wavelength and subpicometer bandwidth, comprising:

- A) a wavemeter monitor monitoring the wavelength of the laser light of at least some of the pulses in each burst and providing a measured wavelength signal representative of the laser pulse wavelength;
- B) a bandwidth requirement monitor receiving a signal indicative of the desired nominal wavelength and providing a wavelength control signal representative of the desired nominal wavelength;
- C) a laser tuning mechanism substantially responsive to the measured wavelength not equaling the desired nominal wavelength adjusting the wavelength of pulses so that the nominal wavelengths of some of the pulses in the burst are slightly longer than the desired nominal wavelength of and some of the pulses in the burst are slightly shorter than the desired nominal wavelength to produce a burst a pulses with an average spectrum centered approximately at the desired nominal wavelength.

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11. (previously presented) An apparatus of Claim 10, further comprising:
the burst of pulses also having an average spectral deviation from the desired
nominal wavelength within a desired deviation.
12. (previously presented) An apparatus as in Claim 10, further comprising:
the laser tuning mechanism comprising a line narrowing unit with a piezoelectric
drive unit.
13. (previously presented) An apparatus as in Claim 11, further comprising:
the laser tuning mechanism comprising a line narrowing unit with a piezoelectric
drive unit.
14. (currently amended) An apparatus as in Claim ~~10~~ 12, further comprising:
the line narrowing unit comprising a tuning mirror driver by a piezoelectric drive
unit.
15. (currently amended) An apparatus as in Claim ~~11~~ 13, further comprising:
the line narrowing unit comprising a tuning mirror driver by a piezoelectric drive
unit.
16. (currently amended) An apparatus as in Claim 10, further comprising:
the wavemeter comprising:
a laser pulse bandwidth detector comprising:
A) a spectrometer having a slit function;
A B) a laser pulse bandwidth spectrum detector producing a raw spectrum data
signal with a slit function bandwidth parameter representative of a bandwidth
parameter of a ~~convolution~~ convolution of the laser pulse spectrum and the slit
function,
B C) a convolver convolving ~~this~~ the slit function bandwidth parameter with the
spectrum data signal bandwidth parameter to form a forward convolved signal W_{FC} ;
and

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© D) a laser pulse bandwidth estimator estimating the laser pulse bandwidth, W_T , according to the formula $W_T = (W_R - (W_{FC} - W_R))$.

17. (currently amended) A photo lithography apparatus having a single material optical image projection lens without a second material of a different refractive index comprising;

- A) a chromatic ~~aberration~~ aberration correction mechanism comprising;
- B) a laser light source ~~preving~~ providing bursts of laser light pulses of a desired nominal wavelength wherein the nominal wavelengths of some of the pulses within the burst are slightly longer ~~then~~ than the desired nominal wavelength and the nominal wavelength of some of the pulses ~~with~~ within the burst are slightly longer than the desired nominal wavelength such that the burst of pulses is within an average spectrum centered approximately at the desired nominal wavelength.

18. (currently amended) The apparatus of Claim 17 further comprising the burst of pulses also having an average ~~structural~~ spectral deviation from the desired nominal wavelength within a desired deviation.